Dual-Cure 9481-E
Light + Moisture-Cure Conformal Coating

APPLICATIONS

- Conformal Coating

FEATURES

- UV/Visible Light Cure
- Secondary Moisture Cure
- Solvent Free
- Very Low VOCs
- Low Odor
- One Part, No Mixing Required

OTHER FEATURES

- Bright Blue Fluorescing
- Chemically Resistant
- MIL-I-46058C
- IPC-CC-830B
- UL 94 V0 Flammability
- UL 746-E

Dymax dual-cure 9481-E is a light- and moisture-cure conformal coating specifically formulated to ensure complete cure for coating that flows underneath components on printed circuit boards. Coating in shadow areas cures over time with ambient moisture. This coating fluoresces a vivid blue when exposed to UV light (365 nm) for easy inspection of coating coverage. Dymax 9481-E is engineered for coating thicknesses up to 0.127 mm [0.005 in]. Dymax dual-cure materials contain no nonreactive solvents. Their ability to cure in seconds enables faster processing, greater output, and lower processing costs. When cured with Dymax light-curing spot lamps, focused-beam lamps, or flood lamps, they deliver optimum speed and performance for conformal coating. Dymax lamps offer the ideal balance of UV and visible light for the fastest, deepest cures. This product is in full compliance with RoHS directives 2015/863/EU.

This product contains Phenol, Isopropylated Phosphate (3:1) (PIP 3:1) (CASRN 68937-41-7) and it's use is regulated under section 6(h) of the Toxic Substances Control Act (TSCA) enforced by the United States Environmental Protection Agency. For more information see: EPA.GOV

UNCURED PROPERTIES *

Property	Value	Test Method
Solvent Content	No Nonreactive Solvents	N/A
Chemical Class	Acrylated Urethane	N/A
Appearance	Colorless/Light Amber Liquid	N/A
Soluble in	Organic Solvents	N/A
Density, g/ml	1.07	ASTM D1875
Viscosity, cP	125 (nominal)	ASTM D2556
Shelf Life at Recommended Conditions from Date of Manufacture	12 months	N/A

CURED MECHANICAL PROPERTIES ¥

Property	Value	Test Method
Durometer Hardness (UV Only)	D65	ASTM D2240
Durometer Hardness	D75	ASTM D2240
Tensile at Break, MPa [psi]	11 [1,600]	ASTM D638
Elongation at Break, %	60	ASTM D638
Modulus of Elasticity, MPa [psi]	150 [21,800]	ASTM D638
Glass Transition Tg, °C	56	ASTM D5418
CTEα_1, µm/m/°C	74	ASTM E831
CTEα_2, µm/m/°C	210	ASTM E831

OTHER CURED PROPERTIES ¥

Property	Value	Test Method
Boiling Water Absorption, % (2 h)	1.4	ASTM D570
Water Absorption, % (25°C, 24 h)	0.2	ASTM D570
Linear Shrinkage, %	1.6	ASTM D2566
Flammability	V0	UL 94
Thermal Shock, -65°C to 125°C	50 cycles	MIL-I-46058C
Moisture Resistance	Passes	MIL-I-46058C
Fungus Resistance (ASTM G21-13)	Passes	MIL-I-46058C

ADHESION

Substrate	Recommendation
Leadframe	✓
Ceramic	✓
PCB	✓
Flex	-
Silicon	o

✓ Recommended o Limited Applications

st Requires Surface Treatment (e.g. plasma, corona treatment, etc.)

* Not Specifications

N/A Not Applicable

¥ Measured after UV cure followed by 15 days at 25°C/50% RH

Technical Data Collected PRIOR TO 2011 Rev.12/19/2024

ELECTRICAL PROPERTIES ¥		
Property	**Value**	**Test Method**
Dissipation Factor (1 MHz)	0.01	ASTM D-150
Dielectric Withstand Voltage, V	>1,500	MIL-I-46058C
Volume Resistivity, ohm-cm	1.01×10^{16}	ASTM D-257
Surface Resistivity, ohm	3.92×10^{15}	ASTM D-257
Dielectric Constant (1 MHz)	3.90	ASTM D-150

CURING GUIDELINES

UV-curing guidelines for 9481-E at 0.003 in (0.076 mm).

Dymax Curing System (Intensity)	**Fixture Time or Belt Speed**
5000-EC (225 mW/cm^2)[A]	40 s
BlueWave® 200 (10 W/cm^2)[A]	5 s
UVCS Conveyor with Fusion D lamp (2.5 W/cm2)[B]	1.5 m/min [5 ft/min]
UVCS Conveyor with one 5000-EC (250 mW/cm2)[B]	0.3 m/min [1 ft/min]

A Intensity was measured over the UVA range (320-395 nm) using a Dymax ACCU-CAL™ 50 Radiometer.
B Intensity was measured over the UVA range (320-395 nm) using a Dymax ACCU-CAL™ 160 Radiometer

SECONDARY MOISTURE CURE

A combination of light and moisture cure is required to achieve full cured mechanical properties. Moisture is also used as a secondary cure mechanism for shadowed areas that cannot be cured with light. While moisture cure time in shadowed areas is typically 2-3 days at 25°C [77°F], 50% RH, actual moisture cure time is application specific and may vary. For material that has been light cured, typical full property development is after 7 days at 25°C [77°F], 50% RH.

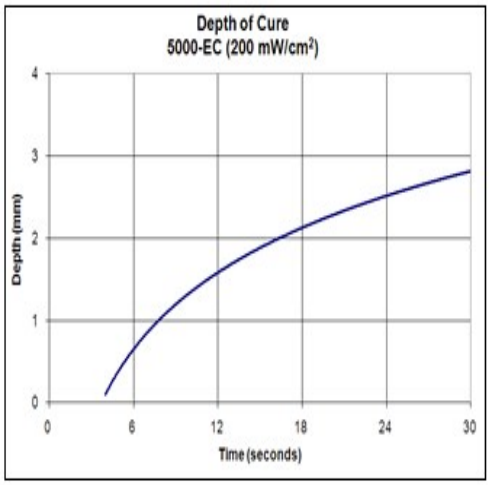
Cure time for both light cured and shadow areas depends on humidity level, amount of material in shadowed areas, and its proximity to humidity. Material entrapped under large components may have a prolonged cure time. Exposure to heat (typically 40°C-60°C) and higher relative humidity will accelerate cure.

Full cure is best determined empirically by curing at different times and intensities, and measuring the corresponding change in cured properties such as tackiness, adhesion, hardness, etc. Full cure is defined as the point at which more light exposure no longer improves cured properties.

Dymax recommends that customers employ a safety factor by curing longer and/or at higher intensities than required for full cure. Although Dymax Application Engineering can provide technical support and assist with process development, each customer must ultimately determine and qualify the appropriate curing parameters required for their unique application.

DEPTH OF CURE

The graphs below show the increase in depth of cure as a function of exposure time with two different lamps at different intensities. A 9.5 mm [0.37 in] diameter specimen was cured in a polypropylene mold and cooled to room temperature. It was then released from the mold and the cure depth was measured.



OPTIMIZING PERFORMANCE AND HANDLING

1. This product cures with exposure to UV and visible light. Exposure to ambient and artificial light should be kept to a minimum before curing. Dispensing components including needles and fluid lines should be 100% light blocking, not just UV blocking.
2. All surfaces in contact with the material should be clean and free from flux residue, grease, mold release, or other contaminants prior to dispensing the material.
3. Cure speed is dependent upon many variables, including lamp intensity, distance from the light source, required depth of cure, coating thickness and amount of material in shadowed areas.
4. Oxygen in the atmosphere may inhibit surface cure. Surfaces exposed to air may require high-intensity (>100 mW/cm^2) UV light to produce a dry surface cure. Flooding the curing area with an inert gas, such as nitrogen, can also reduce the effects of oxygen inhibition.
5. Parts should be allowed to cool after cure before testing and subjecting to any loads or electrical testing.
6. Light curing generally produces some heat. If necessary, cooling fans can be placed in the curing area to reduce the heating effect on components.
7. At the point of curing, an air exhaust system is recommended to dissipate any heat and vapors formed during the curing process.
8. Resealing opened containers under nitrogen extends shelf life.

DISPENSING SUPPORT

The Dymax Application Engineering team is ready to discuss your application requirements to provide the most appropriate dispensing and/or spraying solution. Visit our current dispensing equipment portfolio here or consult our global contact phone numbers and online chat feature (available in North America only) during normal business hours for instant support.

STORAGE AND SHELF LIFE

Store the material in a low humidity, cool, and dark place when not in use. This product may polymerize upon prolonged exposure to ambient and artificial light as well as moisture. This material shelf life noted on page 1 of this document, when stored between 10°C (50°F) and 25°C (77°F) in the original, unopened container. Resealing large containers under dry inert gas, such as nitrogen, can help maintain the shelf life. Smaller syringes and cartridges should be kept in moisture barrier bags with desiccant when not in use.

CLEAN UP

Uncured Dymax dual-cure materials may be removed from dispensing components and parts with non-alcoholic solvents. Alcoholic solvents (such as IPA or ethanol) that contain moisture activate the curing process. Therefore, it is recommended that non-alcohols such as Butyl Acetate Acetone, or MEK be used to clean up uncured material and purge wetted dispensing lines.

Cured material will be impervious to many solvents and difficult to remove. Cleanup of cured material may require mechanical methods such as ultrasonic bath, water jet, vacuum tweezers, air knife and/or warming to aid in the removal.

GENERAL INFORMATION

This product is intended for industrial use only. Keep out of the reach of children. Avoid breathing vapors. Avoid contact with skin, eyes, and clothing. Wear impervious gloves. Repeated or continuous skin contact with uncured material may cause irritation. Remove material from skin with soap and water. Never use organic solvents to remove material from skin and eyes. For more information on the safe handling of this material, please refer to the Safety Data Sheet before use.

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